Study relating to Bagasse based Cogeneration for the state of Maharashtra

Submitted to
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1 Study of Power Purchase Agreements and Detailed Project Reports of Four Projects

Project 1: Kay Pulp & Paper Mills Limited

1.1 Comments on the choice of technology & technical feasibility

1. It is seen that the plant has already been commissioned with 45 Ata steam cycle and it is now operational. In this context it may be mentioned that boiler with higher Ata (60 Ata and above), which are indigenously available would have been more cost efficient.

2. It is presumed that developers have consulted the boiler designers /supplier about the suitability of using alternate fuels during off-season. In case this has not been done, there is a technical risk of not being able to produce power at the rated capacity during off-season.

3. It is seen that the project requires 225 TPD of steam for 70 TPD paper plant. In this context it may be mentioned that rate of consumption of process steam would vary over the day and this would also result in variations in the power output.

1.2 Comments on the financial aspects mentioned in DPR

1 The price of Baggase (Rs. 700/Ton) considered appears to be high. Elsewhere in the same report while providing the 'break up for cost of production of paper' the cost of Bagasse has been considered as Rs. 350 per ton.

2 While working out the annual raw materials requirements the reduction in the requirement of raw materials due to operations at capacities lower than 100 percent has not been considered.

3 While working out the economic benefits due to availability of process steam, the benefit has been computed only on the fuel savings. It should also

have accounted for the fixed cost which in a typical plant, works out to be one fourth of the variable cost.

4 In the estimates for project capital cost some small items, like the establishment cost during construction, raw material cost during commissioning, the cost of detailed engineering etc., are missing. If all these costs are capitalised the project capital cost will increase by 5 to 10 percent.

5 The unit rates for power consumed captively has been considered at a much higher level of Rs. 4/kWh, (considering the price of electricity supplied by MSEB). With the logic of going in for captive power source in order to reduce the electricity bill and to ensure regular supply of electricity, the transfer price of electricity for captive consumption should be considered at the same value at which it is to be supplied to MSEB.

1.3 Project Risk Factors

1 Due to increased demand of Bagasse, the availability of Bagasse may not be adequate. This may lead to an increase in the price of Bagasse. Since there is no captive production source of Bagasse, the fuel availability risk would be there. There is also an element of uncertainty in availability and price of alternate fuels.

2 Fuel accounts for more then 70 to 80 percent of the variable cost of production of power. Since its cost could vary over the years. Depending upon the policy of GoM and the tariff to be decided by the MERC, the returns to the developers could therefore vary.

3 Technically it is possible to run a Bagasse based power plant at the capacity utilisation levels of 90 Percent during the season, as considered in the report. However, considering the non-availability of Bagasse during the off-season, this level of capacity utilisation may not be sustained during off-season.

1.4 Economic Viability of the Project

The major variables on which the economic viability of any project depends are as follows:

- The sales price of the product (Power in this case)

- The capital cost of the project
- The norms of consumption of raw material (Bagasse in this case) and the price of raw material.

The economic viability of the project in the report has been worked out considering the Bagasse price at Rs. 700 per Ton. The sales price for power considered is Rs. 2.88 per kWh. Revenues due to the other minor product (Process steam) considered is the savings in the Bagasse as a result of production due to co-generation operation. The economic viability and the cost of production for different operating years, in the report has been worked out considering 5 percent per annum, escalation in the sales price of the product and all the variable costs.

The cost of production and the economic viability of the project when worked at different prices of Bagasse, give following results.

Table 1.1 Key Pulp & Paper Mills Limited

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam Free

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	10
Rs./Ton	Lakh Rs.	%										
550	1900	23.60	2.90	2.96	2.99	3.02	3.06	3.11	3.16	3.21	3.28	3.38
650	1900	17.50	3.17	3.24	3.29	3.33	3.39	3.45	3.51	3.59	3.67	3.79
700	1900	14.30	3.31	3.39	3.44	3.49	3.55	3.62	3.69	3.77	3.86	3.99
750	1900	11.00	3.44	3.53	3.58	3.65	3.71	3.79	3.87	3.96	4.06	4.20
850	1900	3.80	3.72	3.81	3.88	3.96	4.04	4.13	4.23	4.33	4.45	4.61
Buyback price as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.91
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11

Note:

Capacity utilisation has been considered at 85%.

Table 1.2 Key Pulp & Paper Mills Limited

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam at Rs. 200 Per Ton

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	10
Rs./Ton	Lakh Rs.	%										
550	1900	28.90	2.65	2.71	2.74	2.78	2.82	2.86	2.91	2.97	3.03	3.14
650	1900	23.20	2.92	3.00	3.04	3.09	3.14	3.20	3.27	3.34	3.42	3.55
700	1900	20.20	3.06	3.14	3.19	3.24	3.30	3.37	3.45	3.53	3.62	3.75

750	1900	17.10	3.20	3.28	3.34	3.40	3.47	3.54	3.63	3.72	3.81	3.9
850	1900	10.50	3.47	3.57	3.63	3.71	3.79	3.88	3.98	4.09	4.21	4.3
Buyback price as per the MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.9
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	201 1

Notes:

(a) Transfer price for captive power procurement has been same , at which it will be supplied to MSEB.

(b) Capacity utilisation has been considered at 85%.

1. 5 Technical Specifications as Mentioned in DPR

Capacity	6 MW
Raw Material	Bagasse (during season) Rice Husk/groundnut shells (during off-Season), Furnace oil during off-season if higher rates given by MSEB

Boiler

Steam Flow	32 TPH (Tons Per Hour)
Steam Pressure	45 kg/ Sq. Cm.
Steam Temperature	450 +/- 10 Deg. C
Boiler Outlet Gas Temp.	160 Deg. C
Water Temp. At inlet to economizer	105 Deg. C
Ambient Temperature	40 Deg. C
Relative humidity	60 Percent

T G Set

Inlet Steam Flow	32 TPH
Inlet steam Pressure	44 kg/ Sq. Cm.
Inlet Steam Temp.	420 Deg. C
Extraction	7 TPH at 3.5 bar
Exhaust	25 TPH at 0.12 bar
Power	6000 kWh

1.6 Techno-Commercial Specifications of the Project

▪ Price of Baggase	700 Rs./ Ton (5 Percent

	Increase every year)
▪ Capacity Utilisation	
1st Yr.	70 Percent
2nd Yr.	80 Percent
3rd Yr. onwards	90 Percent
▪ Useful Working Hours	
Working days	330
Working Hours	24
▪ Project Cost	Rs 1900 Lakh
▪ Debt : Equity Ratio	3:1
▪ Interest rate	
Term Loan	16.0 percent
Bank Borrowings	17.5 percent
▪ Additional manpower required	30 Persons
▪ Power Produced	
1st Yr.	33264000 kWh
2nd Yr.	38016000 kWh
3rd Yr. onwards	42768000 kWh
▪ Captive Consumption	11404800 kWh
▪ Sales to SEB	
1st Yr.	21859200 kWh
2nd Yr.	26611200 kWh
3rd Yr. onwards	31363200 kWh
▪ Sales Price	
Power for captive Consumption	4 Rs. /kWh
Power sales to MSEB	2.88 Rs./kWh (increasing at 5% per Yr.)
Process steam (captive consu.)	Considered at the cost of fuel
▪ Baggase requirements	15 tons /hr.

Project 2: Globe Co-generation Power Limited

2.1 Comments on the choice of technology & technical feasibility

1. A systematic approach has been adopted in the Detailed Project Report for technology review and selection. Adoption of 105 bar, 520 Deg. C parameter for the steam turbine which will give 12.4 Percent more power as compared to the case of 67 bar, 485 Deg. C which is presently most prevalent.

2. The plant is designed with Bagasse as fuel to be procured for off-season from the sugar mills in the surrounding areas. In case eof short fall it is proposed to use imported coal. It is recommended that as a contingency measures other biomass fuels like cane trash, rice husk, groundnut shells, cotton stalks etc. should also be considered. All the possible alternative fuels must be put in the specifications of the boiler, so that these can be considered in the design with respect to both feeding system and combustion characteristics.

2.2 Comments on the financial aspects in DPR

1. The price of Baggase considered to be procured from outside is quite high (Rs. 900 per ton). The justification provided for high cost of Bagasse is that the equivalent landed price of imported coal works out to this much. Elsewhere in the report the present day market price of Bagasse has been mentioned as Rs. 300 per ton.

2. Capacity utilisation from the very first year of operation has been considered at 100 percent. It may not be possible to operate the unit at 100 percent capacity in the initial years of operation.

3. The source of other income as considered in the sources of revenue has not been clarified in the DPR.

4. While determining the internal rate of return (IRR) for the project there is a procedural error that the interest on term loan has not been considered. Moreover the residual value of assets has not been considered at 25 percent of the original value, after 10 years. This value should be book value. However for this project these errors does not give significant change in the overall IRR.

2.3 Project Risk Factors

1. In case of shortfall in the availability of Bagasse, there is a provision to use imported coal. The capital costs for coal handling and crushing facilities has

not been included in the project cost. On this account there may be escalation in the capital cost of the project which may make project unattractive. Further the landed cost of imported coal may increase at the rate much higher then 5 percent per annum due to currency rate changes.

2. Fuel accounts for more than 70 to 80 percent of the variable cost of production. Since its cost can very over the years. Depending upon the policies of GoM and the tariff to be decided by MERC, the return to the developers therefore very.

3. It is proposed to use comparatively higher level of technology by using steam parameters of 105 kg / sq. cm and 540 Degree C. This is more efficient than now conventional 64 kg / Sq. cm cycle for power co-generation. However these steam parameters have not been used so far in the country for co-generation of power in a sugar mill.

4. Technically it is possible to run the plant at 100 percent capacity and 330 days a year. However considering the non-availability of Bagasse during the Off-season, this level of capacity utilisation may not be sustained during off-season.

5. Use of imported coal is to supplement the fuel required during off-season. Logistics of delivering the proposed fuel at the site (including facilities for handling & crushing of coal) needs to be evaluated in detail. Further with the use of coal there are other associated issues like stack height, ash disposal, pollution control, which are required to be addressed.

2.4 Economic Viability of the Project

The major variables on which the economic viability of any project depends are as follows:

- The sales price of the product (Power in this case)
- The capital cost of the project
- The norms of consumption of raw material (Bagasse in this case) and the price of raw material.

The economic viability of the project in the report has been worked out considering the Bagasse price at Rs. 900 per Ton for the quantity to be purchased from out side. The sales price for power considered is Rs. 3.32 per kWh. Bagasse during the season has been considered free in exchange of power and process steam to the sugar mill, also a royalty is proposed to be paid to the sugar mill. For the purpose of the present analysis no such considerations has been considered. The economic viability and the cost of production for different operating years, in the report has been worked out considering 5 percent per annum, escalation in the sales price of the product and all the variable costs.

The cost of production and the economic viability of the project when worked at different prices of Bagasse, give the results as given in table 2.1 and 2.2 below. The economic viability of the project has also been evaluated considering a 10 percent escalation in the project cost. This is so as the project cost may increase when the project is actually implemented.

Table 2.1 Globe Co-generation Power Limited

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam Free

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh) 1	2	3	4	5	6	7	8	9	
Rs./Ton	Lakh Rs.	%										
550	11980	23.00	2.22	2.22	2.17	2.13	2.09	2.05	2.02	1.99	1.96	1.9
750	11980	19.90	2.42	2.43	2.39	2.36	2.33	2.30	2.28	2.26	2.25	2.2
950	11980	16.80	2.62	2.64	2.61	2.59	2.57	2.56	2.55	2.54	2.53	2.5
1150	11980	13.60	2.82	2.85	2.83	2.82	2.81	2.81	2.81	2.81	2.82	2.8
550	13178	20.40	2.29	2.29	2.23	2.18	2.13	2.09	2.04	2.00	1.96	1.9
750	13178	17.60	2.49	2.50	2.45	2.41	2.37	2.34	2.30	2.28	2.25	2.2
950	13178	14.60	2.70	2.71	2.67	2.64	2.61	2.59	2.57	2.55	2.54	2.5
1150	13178	11.60	2.90	2.92	2.89	2.87	2.85	2.84	2.83	2.83	2.83	2.8
Buyback pnce as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.9
			2001- 02	2002- 03	2003- 04	2004- 05	2005- 06	2006- 07	2007- 08	2008- 09	2009- 10	201 1

Notes:

(a) Apart from process steam, captive power has also been considered free in exchange of all generated Bagasse.

(b) The Bagasse price considered is for Bagasse procured from outside to the extent of shortfall in the availability of in-house Bagasse. This price of bgasse includes the equivalent price of other alternate fuels, which may be used.

(c) Capacity utilisation has been considered at 85%.

Table 2.2 Globe Co-generation Power Limited

Economic viability & Cost of Production – Considering future escalations in the variables at the rate of 5% Per annum

Process Steam at Rs. 200 Per Ton

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	10
Rs./Ton	Lakh Rs.	%										
550	11980	20.40	2.56	2.57	2.54	2.52	2.49	2.47	2.45	2.44	2.43	2.47
750	11980	17.30	3.00	3.03	3.02	3.02	3.02	3.03	3.03	3.05	3.07	3.14
950	11980	10.10	3.44	3.49	3.51	3.53	3.55	3.58	3.61	3.66	3.71	3.81
1150	11980	1.90	3.88	3.96	3.99	4.03	4.08	4.13	4.19	4.26	4.34	4.47
550	13178	21.40	2.63	2.64	2.60	2.57	2.53	2.50	2.48	2.46	2.44	2.47
750	13178	15.10	3.07	3.10	3.08	3.07	3.06	3.06	3.06	3.06	3.07	3.14
950	13178	8.30	3.51	3.56	3.57	3.58	3.59	3.61	3.64	3.67	3.71	3.81
1150	13178	0.50	3.96	4.03	4.05	4.08	4.12	4.17	4.22	4.28	4.35	4.47
Buyback price as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.91
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11

Notes:

(a) Transfer price for captive power has been considered same at which it will be supplied to MSEB.

(b) Capacity utilisation has been considered at 85%.

2.5 Technical Specifications as Mentioned in DPR

Capacity	30 MW
Raw Material	Baggase

Boiler

Steam Flow	120 TPH (Tons Per Hour)
Steam Pressure	105 kg/ Sq. Cm.
Steam Temperature	520 Deg. C

T G Set

Inlet Steam Flow	118 TPH
Inlet steam Pressure	105 kg/ Sq. Cm.
Inlet Steam Temp.	520 Deg. C
Extraction	30 TPH at 8 bar
Exhaust	72 TPH at 1.5 bar
Power	30000 kWh (in Off-Season) 22650 kWh (Season)

2.6 Techno-Commercial Specifications of the Project

▪ Capacity Utilisation	
1st Yr.	100 Percent
2nd Yr.	100 Percent
3rd Yr.	100 Percent
▪ Useful Working Hours	
Working days	180 (Season) 150 (Off-Season)
Working Hours	24 Per day
▪ Cost of Plant & Machinery	6200 Lakh Rs.
▪ Cost of Misc. Fixed Assets	1000 Lakh Rs.
▪ Project Cost	11980 Lakh Rs.
▪ Debt : Equity Ratio	3:1
▪ Subsidy	7 % of Project Cost considered in Debt
▪ Interest rate	
Term Loan	14.0 percent
Bank Borrowings	14.0 percent
▪ Power Produced	
Season	978.48 Lakh kWh Per Year
Off-Season	1080 Lakh kWh Per Year
▪ Captive Consumption	
Season	291.6 Lakh kWh Per Year
Off-Season	113.4 Lakh kWh Per Year
▪ Sales to SEB	
Season	687 Lakh kWh Per Year
Off-Season	967 Lakh kWh Per Year
▪ Sales Price	
Power for self use	Free in exchange of Bagasse
Power sales to MSEB	3.32 Rs. /kWh (increasing at 5% per Yr.)
Process steam (captive)	Free in exchange of Bagasse
▪ Raw Material requirements	47 tons /hr.

▪ Bagasse price	Rs. 900 / Ton for procurement from outside, increasing at 5 percent per annum, Free from sugar mill in exchange for power & process steam

Project 3: Jawahar SSSK Limited

3.1 Comments on the choice of technology & technical feasibility

The detailed project report submitted pertains to the project for expansion of sugar production capacity from 2500 TCD to 5000 TCD. Power co-generation plan is a small component of the overall expansion project. The detailed project report has not provided adequate details of the capital costs and working results for the co-generation component of the project. Based on the detailed project report it is not possible to work out the economical viability of the co-generation project. The economic viability of the co-generation project has been worked out with the considerations given in the following section. These considerations has been arrived at partly from the contents of the report and partly from the contents of the affidavit submitted by Jawahar SSSK Limited.

1. It is seen that the plant has already been commissioned with 45 Ata steam cycle and it is now operational. In this context it may be mentioned that boiler with higher Ata (60 Ata and above), which are indigenously available would have been more cost efficient.

2. The purpose of co-generation plant is to produce steam at high pressure and introduce it in the single or double extraction steam turbine with steam exhaust under vacuum and generate maximum possible power. The steam from the extractions at 7kg/Sq. Cm (g) and 1.5 kg/Sq. Cm (g) is to be used for the processes in the sugar mill.

    - The above principle is not fully followed (as given in the steam flow cycle, page 64 of the DPR). 8.5 TPH of steam at 45 kg/Sq. Cm (g) is being throttled through Pressure Reducing & De-superheating Station (PRDSH) to produce steam required for the C/F m/c and SO2 burners at 7 kg/Sq. Cm (g). This is total waste of energy that is throttled. In fact, total steam 64+8.5 = 72.5 TPH at 45 kg/Sq. Cm should be introduced in the steam turbine and 8.5 TPH at 7kg/Sq. Cm (g) should be taken from the first stage of extraction. This way more power can be produced.

- The need for all the 'Pressure Reduction Cum De-superheating Stations' (PRDSHs) (section n) of Schedule of Plant and Machinery, page 43) is not clear. Use of PRDSHs is waste of energy and should be avoided except in case of emergency.
- The net steam required for the process is 130 TPH at 1.5 kg/Sq. Cm (g) (refer page 85 of DPR). But the steam flow cycle shows that 121.5 + 14.5= 136 TPH is produced from the exhaust of steam turbines. It is suggested that only the required quantity should be extracted. The balance steam should be allowed to go to steam exhaust under vacuum, and thus produce more power through the turbines.

3. The DPR does not mention anything about use of boilers and turbines during off-season. This means that the plant will work for only 160 days in a year. For optimum utilization of the assets of the co-generation power plant, during off-season the boilers should be run with surplus Bagasse and other bio-mass available from the surrounding areas and the TG sets should be run as condensing units and export power to the grid. This will lead to optimum use of the assets of the co-generation plant.

4. The rate of consumption of Bagasse as considered is very high. This works out to the station heat rate of 6500 to 7000 K Calories per kWh. For the given steam parameters, this should not exceed 5000 k Cal per kWh.

3.2 Project Risk Factors

1. Fuel accounts for more then 70 to 80 percent of the variable cost of production of power. Since its cost could very over the years. Depending upon the policy of GoM and the tariff to be decided by the MERC, the returns to the developers therefore vary.

3.3 Economic Viability of the Project

The major variables on which the economic viability of any project depends are as follows:

- The sales price of the product (Power in this case)
- The capital cost of the project

- The norms of consumption of raw material (Bagasse in this case) and the price of raw material.

The economic viability of the project in the report has been worked out considering the Bagasse price at Rs. 380 per Ton. The sales price for power considered is Rs. 3.32 per kWh. The norms of consumption of fuel considered is quite high. Revenues due to the other minor product (Process steam) has not been. The economic viability and the cost of production for different operating years, in the report has been worked out considering 5 percent per annum, escalation in the sales price of the product and all the variable costs.

The cost of production and the economic viability of the project when worked at different prices of Bagasse, give the results as given in table 3.1 and 3.2 below.

Table 3.1 Jawahar SSSK Limited:

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam Free

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	10
Rs./Ton	Lakh Rs.	%										
0	2357	33.4	1.15	1.13	1.08	1.03	0.98	0.92	0.87	0.82	0.78	0.76
Buyback price as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.91
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11

Notes:

(d) Apart from process steam, captive power has also been considered free in exchange of all generated Bagasse.

(e) The Bagasse price considered is for Bagasse procured from outside to the extent of shortfall in the availability of in-house Bagasse. This price of bgasse includes the equivalent price of other alternate fuels, which may be used.

(f) Capacity utilisation has been considered at 85%.

Table 3.2 Jawahar SSSK Limited:

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam at Rs. 200 Per Ton

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	10
Rs./Ton	Lakh Rs.	%										
350	2357	36.9	2.53	2.58	2.60	2.62	2.65	2.68	2.72	2.76	2.81	2.90
380	2357	26.1	2.94	3.01	3.05	3.10	3.15	3.21	3.27	3.34	3.42	3.54
450	2357	14.3	3.36	3.44	3.51	3.58	3.65	3.73	3.82	3.92	4.03	4.17
550	2357	0	3.77	3.88	3.96	4.05	4.15	4.26	4.38	4.50	4.64	4.81
650	2357	-22.4	4.18	4.31	4.42	4.53	4.65	4.79	4.93	5.08	5.24	5.45

Buyback price as per MNES	3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.91
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11

Notes:

(c) Transfer price for captive power has been considered same at which it will be supplied to MSEB.

(d) Capacity utilisation has been considered at 85%.

3.4 *Technical Specifications*

Capacity	17 MW
Raw Material	Baggase

Boiler

Steam Flow	90 TPH (Tons Per Hour)
Steam Pressure	45 Kg/ Sq. Cm.
Steam Temperature	435 +/- 5 Deg. C

T G Sets (Two Nos.)

Set I (to be used for export of power)

Inlet Steam Flow	64 TPH
Inlet steam Pressure	45 kg/ Sq. Cm.
Inlet Steam Temp.	440 Deg. C
Power	8000 kWh

Set II (To be used for captive power Requirements)

Inlet Steam Flow	72 TPH
Inlet steam Pressure	45 Kg/ Sq. Cm.
Inlet Steam Temp.	440 Deg. C
Power	9000 kWh

3.5 *Techno-Commercial Specifications of the Project (T G Set I)*

▪ Capacity Utilisation	
1st Yr.	60 Percent
2nd Yr.	75 Percent
3rd Yr. onwards	90 Percent
▪ Useful Working Hours	
Working days	160 Per year (only during season)

Working Hours	24 Per day
▪ Cost of Plant & Machinery	2090 Lakh Rs.
▪ Project Cost	2357 Lakh Rs.
▪ Scheme of Finance	
Term Loan from NCDC	41.5 Percent
Term Loan from SDF	18.7 Percent
Equity	8.3 Percent
Deposits	31.5 Percent
▪ Interest rate	
Term Loan	13.4 percent
Bank Borrowings	14.0 percent
▪ Additional manpower	30 Persons
▪ Power Produced	652.8 Lakh kWh Per Year
▪ Captive Consumption	345.6 Lakh kWh Per Year
▪ Sales to SEB	307.2 Lakh kWh Per Year
▪ Sales Price	
Power for captive	3.32 Rs. /kWh
Process steam (captive)	No cost assigned
▪ Bagasse price	Rs. 380 / Ton
▪ Rate of Bagasse Consumption	60 Tons Per Hour

Project 4: Vaidyanath SSK Limited

4.1 Comments on the choice of technology & technical feasibility

1. 60 Ata co-generation system chosen is feasible

2. It should be ensured that the design of boiler is capable of using alternate biomass / coal fuels during off-season as proposed in the DPR.

3. During phase I, the power output projected during season is 13.23 MW and during off season 9 MW. The maximum amount of exhaust steam that can be condensed is 40 TPH. The same can be done during off-season also and thus producing 10 MW rather then 9 MW through condensing 35 THP. This might be corrected. The boiler output will then be 5 TPH (for the steam extracted at 1.2 Ata) plus 40 TPH totaling to 45 TPH. This

modification gives export of additional 2.88 million kWh during off-season of 120 days.

4. One of the two 32 TPH, 32 bar boilers may be run during off-season at part load to run the 3.5 MW turbine and export this power. For this only a condenser would have to be installed. This modification can give about 10 million kWh additional export of power.

5. With the above two suggested modifications (points 6 and 7), additional 12.88 million kWh can be exported.

6. During phase II it is proposed that one more boiler of 67 bar, 60TPH and one 10 MW back-pressure turbine is added. With this the 32 TPH, 32 bar boiler will become redundant. With this scheme, the total export of power will be 110.32 Million kWh.

7. Comparing points 5 and 6 above it may be seen that difference in export of power is only 7.44 million kWh per year. This would not justify additional installation of a 67 bar, 60TPH boiler and a 10 MW steam turbine.

8. If additional Bagasse is expected to be available when crushing capacity goes up to 3600 TCD, the capacity of the boiler for phase I itself can be enhanced suitably and correspondingly the TG set capacity can be enhanced. This will compensate more than 7.44 Million kWh export of power mentioned in point 7 above. The additional cost thus required for Phase-I, will be nominal only. This scheme will offset the need for phase II. The only condition is that boilers of 32 TPH, 32 bar should be maintained properly and run continuously throughout the year. This should be possible. These boilers were commissioned with the sugar plant in the year 1999-2000 only.

4.2 Comments on the financial aspects in DPR

1. The price of Baggase (Rs. 500 per Ton) considered is high. No justification has been provided for considering the high cost of Bagasse.

2. No economic benefits for use of process steam have been considered.

3. The capacity utilisation has been considered at 100 Percent from the very first year of operations. This level of capacity utilisation may not be sustained through out the year due to poor availability of Bagasse or other agro–waste material during the off-season. However there is no published study till date on this aspect.

4.3 Project Risk Factors

1. Fuel accounts for 70 to 80 percent of the variable cost of production of power. To ensure long term sustainability of the project, any variation in the cost of Bagasse should be compensated by way of corresponding increase in the power procurement price.

2. Use of coal as alternate fuel during off-season has been considered. The logistics of delivering the coal (including coal handling and crushing) needs to be examined in detail. Further to this with the use of coal there are other associated issues like, stack height, disposal of ash, pollution control etc., which are required to be addressed.

4.4 Economic Viability of the Project

The major variables on which the economic viability of any project depends are as follows:

- The sales price of the product (Power in this case)
- The capital cost of the project
- The norms of consumption of raw material (Bagasse in this case) and the price of raw material.

The economic viability of the project in the report has been worked out considering the Bagasse price at Rs. 500 per Ton. The sales price for power considered is Rs. 3.16 per kWh. Revenues due to the other minor product (Process steam) has not been considered. The economic viability and the cost of production for different operating years, in the report has been worked out considering 5 percent per annum, escalation in the sales price of the product and all the variable costs.

The cost of production and the economic viability of the project when worked at different prices of Bagasse, give the results as given in table 4.1 and 4.2 below.

Table 4.1 Vaidyanath SSK Limited:

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam Free

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)								
			1	2	3	4	5	6	7	8	9
Rs./Ton	Lakh Rs.	%									
550	4311	26.70	2.02	2.02	1.99	1.95	1.92	1.90	1.87	1.85	1.83
650	4311	24.90	2.11	2.12	2.09	2.06	2.04	2.01	2.00	1.98	1.97
750	4311	23.10	2.21	2.22	2.19	2.17	2.15	2.13	2.12	2.11	2.10
850	4311	21.30	2.30	2.32	2.30	2.28	2.26	2.25	2.24	2.24	2.24
550	4742	23.90	2.08	2.08	2.04	2.00	1.96	1.93	1.89	1.86	1.83
650	4742	22.20	2.18	2.18	2.14	2.11	2.07	2.04	2.02	1.99	1.97
750	4742	20.50	2.27	2.28	2.25	2.21	2.19	2.16	2.14	2.12	2.11
850	4742	18.80	2.37	2.38	2.35	2.32	2.30	2.28	2.26	2.25	2.24
	Buyback price as per MNES		3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10

Note:

Capacity utilisation has been considered at 85%.

Table 4.2 Vaidyanath SSK Limited:

Economic viability & Cost of Production - Considering future escalations in the variables at the rate of 5% Per annum

Process Steam at Rs. 200 Per Ton

Bagasse Price	Project Cost	IRR	Cost of Production (Rs./kWh)								
			1	2	3	4	5	6	7	8	9
Rs./Ton	Lakh Rs.	%									
550	4311	26.20	2.76	2.80	2.80	2.80	2.81	2.83	2.85	2.87	2.90
650	4311	21.70	2.99	3.04	3.05	3.07	3.10	3.12	3.16	3.20	3.24
750	4311	17.00	3.23	3.29	3.31	3.34	3.38	3.42	3.47	3.52	3.58
850	4311	12.10	3.46	3.53	3.57	3.61	3.66	3.71	3.78	3.85	3.92
550	4742	23.40	2.82	2.86	2.85	2.85	2.85	2.86	2.87	2.89	2.91
650	4742	19.30	3.06	3.10	3.11	3.12	3.13	3.15	3.18	3.21	3.25
750	4742	14.80	3.29	3.35	3.36	3.39	3.41	3.45	3.49	3.53	3.59
850	4742	10.10	3.52	3.59	3.62	3.66	3.70	3.74	3.80	3.86	3.93
	Buyback price as per MNES		3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10

Note:

(a) Bagasse price considered is both for internal transfer & for procurement from outside.

(b) The transfer price of captive power has been considered at the level at which it is sold to MSEB.

(c) Capacity utilisation level has been considered at 85% for all the years of operations.

4.5 Technical Specifications as Mentioned in DPR

Capacity	15 MW 1st phase + 10MW in 2nd phase
Raw Material	Baggase (during season) Bagasse or coal (during off-Season)
Boiler	
Steam Flow	60 TPH (Tons Per Hour)
Steam Pressure	60 kg/ Sq. Cm.
Steam Temperature	480 +/- 10 Deg. C
T G Set	
Inlet steam Pressure	60 kg/ Sq. Cm.
Inlet Steam Temp.	480 +/- 10 Deg. C
Extraction	5 TPH at 7 bar
Exhaust	15 TPH at 1.2 bar
Power	15000 kWh

4.6 Techno-Commercial Specifications of the Project

▪ Price of Bagasse	500 Rs./ Ton (5 Percent Increase every year)
▪ Capacity Utilization	
1st Yr.	100 Percent
2nd Yr.	100 Percent
3rd Yr.	100 Percent
▪ Useful Working Hours	
Working days (Season)	180
Working days (Off-Season)	120
Working Hours in a day	24
▪ Project Cost	Rs 4334 Lakh
▪ Debt : Equity Ratio	3:1
▪ Interest rate	
Term Loan	14.0 percent
Bank Borrowings	14.5 percent

▪ Additional manpower	90 Persons
▪ Power Produced	
Season	648 Lakh kWh Per yr.
Off-Season	288 Lakh kWh Per yr.
▪ Captive Consumption	
Season	245 Lakh kWh Per yr.
Off-Season	29 Lakh kWh Per yr.
▪ Sales to SEB	
Season	403 Lakh kWh Per yr.
Off-Season	259 Lakh kWh Per yr.
▪ Sales Price	
Power sales to MSEB	3.16 Rs. /kWh (increasing at 5% per Yr.)
Process steam (captive)	Free
▪ Bagasse requirement	26 tons /hr.

Project 5: Pravara Power Private Limited

5.1 Comments on the choice of technology & technical feasibility

1. A sugar mill of 4500 TCD capacity can at best support a co-generation project of 24 MW capacity when operated at the steam parameters considered in the report. The capacity of 35 MW as considered in the report can be supported on this mill if higher pressure rating of 84 Bar is considered.

2. Due to higher size of the co-generation plant the requirement of alternate fuel is much more. It may be difficult to procure this much quantity of additional bagasse / alternate bio-mass. The project has considered use of Furnace Oil (FO) as an alternate fuel. Due to use of FO as alternate fuel the cost of production is comparatively higher. Further to this FO normally has high sulphur content, this will lead to environmental problems at local level.

3. The heat transfer mechanism in oil fired boiler and a solid fuel fired boiler are entirely different. A boiler originally designed for baggase may not work at the same level of efficiency while using Liquid Fuel (FO in this case).

5.2 Comments on the financial aspects in DPR

1. While providing the workings for payback period and internal rate of return (IRR) for the project, the interest on the term loan has not been added back.
2. In the workings for IRR the residual value of the project at the end of 10 years of operation has not been considered at book value. The residual value considered is much lower.

3. The capital cost of the project as worked out in the report is very much on the higher side.

4. In the estimates of working results (Profitability Statement), a value has been considered for "mill modernisation cost" written off. While at the same time the cost of mill modernisation has not been capitalised in the estimates for project capital cost.

5.3 Project Risk Factors

1. As such the capital cost of the project is high. Any escalation in the project cost during implementation of the project will make the project unattractive.

2. Due to increased demand of bagasse, the availability of bagasse may not be adequate. This may lead to an increase in the price of bagasse. Since the captive source of bagasse is not sufficient to meet the demand even during season, fuel availability risk would be there. There is also an element of uncertainty in availability and price of bio mass alternate fuels.

3. Fuel accounts for more then 70 to 80 percent of the variable cost of production of power. Since its cost could vary over the years. Depending upon the policy of GoM and the tariff to be decided by the MERC, the returns to the developers could therefore vary.

4. Technically it is possible to run a bagasse based power plant at the capacity utilisation levels of 90 Percent during the season, as considered in the report. However, considering the limited availability of bagasse during the

off-season, this level of capacity utilisation may not be sustained during off-season.

5.4 Economic Viability of the Project

The major variables on which the economic viability of any project depends are as follows:

- The sales price of the product (Power in this case)
- The capital cost of the project
- The norms of consumption of raw material (Bagasse in this case) and the price of raw material.

The economic viability of the project in the report has been worked out considering the bagasse free in exchange of power for captive consumption and the process steam for captive consumption. The economic viability and the cost of production for different operating years, in the report has been worked out considering 5 percent per annum escalation in the sales price of the product and all the variable costs.

The cost of production and the economic viability of the project when worked at different prices of Bagasse, give following results.

Table 5.1 Pravara Power Private Limited:

Economic viability & Cost of Production – Considering future escalations in the variables at the rate of 5% Per annum

Process Steam Free

Bagasse Price	FO Price	IRR	Cost of Production (Rs./kWh)									
			1	2	3	4	5	6	7	8	9	
Rs./Ton	Rs./Ton	%										
0	7160	10.7	3.05	3.07	304	3.01	2.99	2.97	2.96	2.95	2.95	3
Buyback price as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	201

Notes:

(a) Apart from process steam, captive power has also been considered free in exchange of all generated Bagasse.

(b) The Bagasse price considered is for Bagasse procured from outside to the extent of shortfall in the availability of in-house Bagasse. This price of bgasse includes the equivalent price of other alternate fuels, which may be used.

(c) Capacity utilisation has been considered at 85%.

Table 5.2 Pravara Power Private Limited:

Economic viability & Cost of Production – Considering future escalations in the variables at the rate of 5% Per annum

Process Steam at Rs. 200 Per Ton

Bagasse	FO	IRR	Cost of Production (Rs./kWh)									
Price	Price		1	2	3	4	5	6	7	8	9	10
Rs./Ton	Rs./Ton	%										
550	7160	16.6	3.19	3.21	3.19	3.17	3.16	3.15	3.14	3.14	3.15	3.21
750	7160	13.2	3.41	3.45	3.44	3.43	3.43	3.44	3.45	3.46	3.48	3.57
950	7160	9.6	3.64	3.69	3.69	3.70	3.71	3.73	3.75	3.78	3.82	3.92
Buyback price as per MNES			3.17	3.32	3.49	3.67	3.85	4.04	4.24	4.45	4.68	4.91
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11

Notes:

(a) Transfer price for captive power has been considered same at which it will be supplied to MSEB.

(b) Capacity utilisation has been considered at 85%.

5.5 Technical Specifications as Mentioned in DPR

Capacity	35 MW
Raw Material	Bagasse & Furnace Oil (during season) Bagasse & Furnace Oil (during off-Season),

Boiler

Steam Flow	2*95 TPH (Tons Per Hour)
Steam Pressure	67 kg/ Sq. Cm.
Steam Temperature	487 Deg. C

T G Set

Inlet steam Pressure	64 kg/ Sq. Cm.
Inlet Steam Temp.	480 Deg. C
Extraction	7 TPH at 3.5 bar 98.7 TPH at 1.5 bar 31.5 TPH at 10 Bar
Condensing Steam	55.6 TPH
Power	35 MW

5.6 Techno-Commercial Specifications of the Project

• Price of Baggase	Free in exchange of captive power and process steam
▪ Capacity Utilisation	
Ist Yr.	80 Percent
2nd Yr.	85 Percent
3rd Yr.	90 Percent
4th Yr. Onwards	95 Percent
▪ Useful Working Hours	
Working days	330
Working Hours	24
▪ Project Cost	Rs 16800 Lakh
▪ Debt : Equity Ratio	70:30
▪ Power Sales to SEB	
1st Yr.	152545 Ths. Units
2nd Yr.	162714 Ths. Units
3rd Yr.	172884 Ths. Units
4th Yr, Onwards	183054 Ths. Units
▪ Sales Price	
Power for captive Consumption	Free in exchange of Bagasse
Power sales to MSEB	3.01 Rs./kWh (increasing at 5% per Yr.)
▪ Process steam (captive consumption)	Free in exchange of baggase

2

Policy Framework for Bagasse based Cogeneration in Maharashtra

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(Refer to ToR tasks Activity III & VI)

Introduction

There is substantial scope for energy generation through non-conventional energy sources especially through Bagasse based cogeneration in Maharashtra. As per the estimates of MEDA, the potential for Bagasse based cogeneration in Maharashtra stands at 1000 MW. In today's energy scenario, where energy costs are increasing, availability of power is not assured, and the gap between demand and supply is widening, Cogeneration not only ensures an economical and efficient utilization of energy but will also contribute to the betterment of the environment. Therefore, in this context a pro-active policy for promotion of Bagasse based cogeneration, which would also keep in view the viability of the electricity sector in the state, and the interest of the consumer assumes importance.

The Government of Maharashtra (GoM) adopted a policy in January 1996 to promote private sector participation in energy generation through non-conventional sources. In the meanwhile, the Government of India had issued certain new guidelines to promote non-conventional energy generation. Keeping these guidelines and recommendations of the committee appointed by the GoM to study the difficulties being faced by the developers of Cogeneration projects, a revised policy was announced in 1997. Subsequently, the GoM has also made modifications in its policy on Bagasse based Cogeneration through GR in 1998 and 1999. Maharashtra State Electricity Board (MSEB) has also made certain modifications to this policy time to time through its Departmental Circulars.

In view of the adverse affects on MSEB's financial position due to some of the provisions of the existing policy, MSEB has put forward a modified version of policy before the GoM for consideration. In a meeting held on 10th May 2001, under the Chairmanship of hon'ble Chief Minister of Maharashtra it was decided that government will develop a modified policy for projects which will be received in future; but before finalizing this policy MSEB would seek the approval of Maharashtra Electricity Regulatory Commission (MERC). Accordingly, the above modified policy document being prepared by MSEB under consideration by the GoM has been submitted to MERC for its consent.

Taking note of the above, MERC has requested TERI to prepare a Policy for Bagasse based Cogeneration incorporating comments on the various provisions of the proposed policy, and its own recommendations.

This policy will be prepared keeping in view the current and future power scenario in the state, and balancing economic principles with environmental consideration to achieve sustainable development and financial viability in the power sector.

Keeping this objective in view TERI has studied the existing policy of GoM, proposed modifications of MSEB (provisional translation received on 29th December 2001) as well as the guidelines of MNES, captive power policy by Ministry of Power, Government of India (GoI) and objections raised by individuals and organizations on the same. Our specific comments on the modified Policy proposal of MSEB to the GoM are given in Section I. A revised Policy incorporating our views is at Section II. A brief overview of the power supply position in the state is at Annex A.

An overview of various pricing approaches for non-conventional energy including Bagasse

Pricing of electricity as per the MNES guidelines

For encouraging investment by the private and public sector companies in power generation through Renewable, a set of guidelines were issued by the Ministry of Non-conventional Energy Sources (13/09/1993) for consideration by the States.

With regard to pricing the electricity based on Cogeneration and other non-conventional sources, MNES guidelines stipulate that the SEBs will purchase electricity offered by the producer at a minimum rate of Rs. 2.25 per unit with no restrictions on time or quantum of electricity supplied for sale. This rate will be will be reviewed every year and will be linked to standard criteria such as Wholesale Price Index. The producer will also have the option to sell the electricity generated by him to a third party within the state at a rate to be mutually settled between them. All transactions between the Board and the producer involving wheeling, banking or sale of power will be settled on a monthly basis.

The rationale for Rs 2.25 per unit is not spelt out anywhere. It appears that this was linked to the highest cost of power generation when MNES issued the policy guidelines as an incentive to cogeneration.

Pricing of electricity as per the Captive Power Policy of MoP

The MoP announced its policy for the promotion of Captive Power Plants including Cogeneration in 1996 with the objectives of achieving higher efficiency in fuel use in the industry and as well as the availability of surplus electricity to the State grid. This policy of MoP does not refer to any guidelines issued by the MNES in this regard.

As per the MoP policy (document sent to various state governments in July 2001), the tariff "could be based on pooled variable charge of thermal power stations operating in the SEB plus some percentage of the pooled variable charges as an incentive...". And "To attract more power from CPPs, tariff could also be based on the highest variable cost in the system or the actual variable cost, whichever is lower and some percentage of variable cost as incentive". It does not deal with cogeneration explicitly.

Pricing of power by other SEBs/SERCs

Many states have announced their policies based on MNES guidelines though in varying measures.

For example, Rajasthan in its policy has decided on a rate of Rs 2.75 per unit in 1998–99 with annual escalation of 5% in line with the MNES guideline with 1994–95 as the base year. On the other hand in the case of UP, the base price of Rs 2.25 per unit was decided for the year 1999–2000.

The SERCs of AP and Karnataka have recently issued orders on pricing of power purchase from cogenerators. APERC, in its order, has assumed a base price of Rs 2.25 per unit as mentioned in the MNES guidelines with an annual escalation of 5%. However, the APERC would suo motu review the price in the year 2004 after discussions with all concerned parties. Until then this pricing approach will continue.

Karnataka too has allowed the prices set on the basis of the guidelines issued by the MNES with Rs 2.25 per unit as a base price in the year 1994–95 and an annual escalation of 5%.

The escalation factor appears to be ad-hoc in nature. The rationale for 5% escalation is not spelt out clearly anywhere. Nevertheless, it appears slightly lower than increase in WPI.

Section I

Observation on the Draft Policy of GoM

The policy should include in the first para, a definition of bagasse based cogeneration. Our observations on the proposed policy are discussed below:

Government Resolution (Section i, ii & iii):

The proposed modified policy has categorized the cogeneration projects into three categories namely:

i. Projects which have already entered into an Energy Purchase Agreement (EPA) with the Board,
ii. Projects approved by the Government and are involved in getting other necessary clearances,
iii. Future projects.

As per the proposed policy, the Government would not subsidize the difference in the tariff determined by the MSEB (as per MSEB's Circular of 8/12/1997) and the MERC for the existing projects. At the same time the Government would compensate the 9 projects (which have been approved by the government and are in the process of obtaining necessary clearances) for the price difference as worked out in line with GoM policy and as approved by the MERC.

☞ *TERI's views:*

There appears to be no rationale behind this approach. We suggest that projects, which have not executed Energy Purchase Agreement (EPA) with the Board but have obtained necessary clearances a choice, be given to opt for being considered under either the old policy or the new policy now being formulated.

Projects that have already signed EPA with the Board should be governed by the existing policy of the GoM. The Board shall pay the price to such cogenerator as worked out in line with the provisions of existing policy of GoM and these should be allowed as legitimate costs in their tariff proposal to MERC. All future projects will be governed by the new policy now being formulated.

The duration for power purchase agreement in the proposed GoM draft policy has been reduced from 20 years to 15 years. Considering the life of cogeneration projects, 20 years terms may be restored.

The policy with regard to Power Plants commencing in future:

i) Rate of Electricity:

Pricing of power by MSEB

The MSEB has been purchasing energy from cogeneration plants as per the existing policy of GoM at the rate of Rs. 2.25 per unit corresponding to the base year of 1994-95 with an annual escalation of 5%. However, this 5% escalation is to be made available for the first 10 years of the project life only and subsequently there will be no escalation for next 3 years and thereafter, for the balance life of the project (7 years) an escalation of 5% per annum will be available to the developers. The reason as given by the GoM for this escalation slabs was that by the end of 10 years, the liability of the project reduces after repayment of the debt. MSEB has also proposed a ceiling of 90% of HT base energy tariff.

The GoM policy has assumed a flat escalation rate of 5% in different blocks, and is not linked to factors such as WPI to be reviewed each year as suggested by the MNES in its guidelines. The escalation factors appear to be *ad hoc.*

In the latest proposed policy (prepared by MSEB) under consideration by the GoM, timeframe of these escalation slabs have been further modified. Now, the rate for the first 5 years would be escalated at 5% per annum cumulative. In the next 3 years, the rate will be constant and for the remaining period of 7 years (assuming project duration of 15 years) will be escalated at 5% per annum cumulative.

☞ *TERI's views:*

A percentage escalation or growth conventionally implies a cumulative rate of growth, not a simple rate of growth. As such, although there was no specific mention of whether the escalation to be provided would be on cumulative or not in both the MNES guidelines and GoM policy dated 18th October 1997, it can be taken as implied. MSEB was also silent on this issue till the Resolution No. 920 passed on 27/3/2001, which stated that the escalation would not be compounded. However, in the revised policy that is under consideration, it has been made clear that the base price would be increased on a cumulative basis.

Some of the options for pricing are discussed below:

- *Prices based on variable charge*
  Prices can potentially be set on the basis of pooled variable charge (reflecting the short-run marginal cost of power generation) of power stations operating in a state provided there is a situation of surplus capacity with no trading options. Some percentage of the pooled variable charges may be provided as an incentive to the cogenerator. The actual power supply position in the state shows that Maharashtra is currently facing shortages, and is likely to have shortages in the foreceeable future also (Annex–A). Therefore, we feel that prices based on variable charges may not be appropriate for attracting co-generation.

- *Cost plus approach*
  A study of the various documents shows that cost of generation in a cogeneration plant could vary over a wide range depending upon the size of the plant, its configuration, cost of bagasse, purchase price of alternate fuel etc. Therefore, in the cost plus approach, the Commission may need to set up benchmarks/ guidelines for profitability and evaluate each individual project separately. This would require detailed scrutiny of various cost components and project design for each project in order to avoid any cost–padding. Also, considering small size and large number of these projects, it would be too time consuming and would require resources by the Commission and the MSEB. Therefore, we suggest that the cost–plus approach may not be appropriate at this stage.

- *Marginal power purchase price*
  Another pricing option would be to consider either the (i) marginal cost of power procurement by the utility or (ii) its average cost of power procurement. However, since in India we are typically following the cost-plus approach for pricing power from existing plants the average cost of power purchase may be biased towards historic costs that reflect the depreciated cost of the generation facilities.

In the new scenario, prices will move gradually towards a market based pricing system as the new capacities are being based on a competitive bidding process. Since, bagasse based cogeneration can be said to be displacing power procurement requirements at the margin, the power purchase price from bagasse based cogeneration plants should be linked to the marginal cost of power purchase by the utility.

The "marginal cost of power purchase" here is defined as the unit (fixed+variable) cost of power purchase from the plant which is lowest in the merit order stack. Ideally such a marginal cost for the utility should be arrived at every month and, for purposes of simplicity, adjustments in tariffs may be made on an annual basis. However, if for any reason this increases the complexity of transactions, marginal cost number may be arrived at on an annual basis.

This would provide an economic rationale for pricing and the utility would be indifferent between power purchases from the cogenerator and the marginal plant. The purchase price for the "Firm"[a]power (as agreed in the EPA) may be taken as a certain percentage of the marginal cost of power purchase. This percentage could be defined by the ERC within a given band of say 80-100 % keeping in view the market conditions. The reason for suggesting the possibility of a price lower that the marginal cost is to make cogenerated power more attractive to the utility rather than have it being indifferent. "In-firm" [b] power can be priced at a lower level and may be pegged at the variable cost of the marginal plant.

We are of the view that this approach would be based on sound economic principles, be fair to the utility and at the same time offer adequate incentives to the cogenerators for promotion of cogeneration in the state.

ii) Protection due to change in Foreign Exchange Rate:

Protection given vide GoM GR No. 1097/CR 68/Energy –7, Mantralaya, Mumbai- 32 dated 18.10.97 should be cancelled.

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[a] Firm Power means the quantum of energy, which a supplier is obliged to deliver as scheduled in the given period.

[b] In-firm Power means the energy supplied over and above the firm power which is interruptible on very short notice.

☞ *TERI's views:*

Generally, cogeneration projects do not involve large investments, and also their gestation period is mush less compared with conventional power projects. Therefore, even if there were a foreign debt component in the total investment, the impact on the developer on account of variations in the foreign exchange rate would not be much. Additionally the pricing approach proposed above de-links the price for cogenerated power from the cost of production. Therefore, we agree with the modified proposal to disallow the protection due to change in foreign exchange rate.

iii) Evacuation Arrangement:

Presently, the Board allows the grid interconnection for sale of surplus power and standby use.

As per the existing policy of GoM, the responsibility for providing evacuation facilities solely rests with the MSEB. It states that the MSEB shall bear the cost of evacuation arrangement from the project switchyard up to the MSEB sub-station. All the other related expenditure at the site shall be borne by the developer. The same was followed by MSEB till it announced its new policy on 27/3/2001. As per revised provision in the MSEB and GoM policy, they have proposed to charges Rs 3 Lakhs per MW from the cogeneration plant owners towards the cost of evacuation.

☞ *TERI's views:*

The cost of lines required for linking the switchyard of the project with that of MSEB would not only depend upon the amount of power to be evacuated but also to the length and the voltage of the line. Hence, it is not correct to charge just on the basis of MW of power only. The rationale of Rs 3 Lakhs per MW is also not clear.

Since most cogeneration plants require some power during off-season, chances are that they already are bonafide consumers of the board and in case surplus power is to be fed into the state grid, the lines could be suitably uprated/upgraded for this purpose. It is felt that such additional costs will not be significant, and therefore, it is suggested that the cost of evacuation facility up to the nearest receiving sub-station of Board be borne by the MSEB. All other related expenditure at the cogenerator's switchyard will have to be borne by the developer.

iv) "Pass through" of Alternate/Conventional Fuel Cost:

The proposed policy under consideration does not allow any pass-through of conventional fuel cost on the tariff. The 1997 policy of GoM on cogeneration of electricity allows the pass-through on the tariff due to extra cost as a result of variations in the fuel cost. The maximum limit of this pass-through was increased from 25% to 40% in the revised policy of GoM 1998. The pass-through would not be applicable for any generation over and above 40% of the total generation of the plant using conventional fuel. The responsibility to ensure availability of conventional fuel will lie with the cogenerator.

☞ *TERI's views:*

Since we are providing prices linked to marginal cost of power purchase, it is felt that a provision for "pass through" is not necessary.

vii) Sale to Third party

As per the existing and proposed policy, the surplus energy from bagasse based cogeneration will be sold entirely to the Board. However, if there is no demand or if there is default in payment in energy bills, developer can sell such power to third party(s) i.e., industrial/commercial consumers, after accounting for the stipulated wheeling charges and transmission losses. In this case the cogenerator will be treated as "Merchant generator".

☞ *TERI's views:*

'Third party sale" has its own pros and cons to the utility and the cogenerator. By permitting third party sale (TPS), there is a possibility that the Board may lose some of the HT customers thus reducing the flexibility for cross subsidy. The cogenerator may benefit by getting a higher price and more credible customers. On the other hand, if the cogeneration policy expects the utility to purchase all the surplus power available from bagasse based cogeneration under the pricing strategy proposed elsewhere in this document, then the cogenerator has the comfort of having an assured offtake at economically rational prices. To allow

TPS in addition to a mandatory buy-back of surplus cogenerated power by the utility would tilt the balance irrationally in favour of the cogenerators.

It also needs to be recognized that Maharashtra has a policy by which TPS are not allowed by captive generators. The first recommendation is, therefore, that the policy regarding TPS should be uniformly applicable for surplus power – the rationale for both being more efficient utilization of existing assets - from both captive generators and co-generators. However, since we are talking here only about bagasse based co-generation, we would like to suggest that eligible bagasse based co-generators of electricity be required to make a choice upfront of either (i) entering into an arrangement with the utility under the terms of this policy or (ii) opt for the TPS route with an appropriate wheeling charge, transmission losses and any other surcharge that MERC may wish to impose to compensate the utility for a reduced cross-subsidization potential[a]. In the former case, the co-generator would benefit from an assured buy-back of power and has a price linked to the marginal power procurement cost of the utility but will lose the option of TPS for the duration of this policy. In the latter case, the utility would be absolved of its responsibility to the co-generator vis-à-vis both assured buy-back and the price linkage. If the co-generator at some time wishes to sell power to the utility, the price for such a transaction would be based on a negotiated settlement.

However, if the cogenerator wants to sell the power to its own sister concern(s) located away from the plant the same shall also be allowed with a 3 month notice to the utility and subject to the conditions that the cogenerator will pay the wheeling charges and transmission losses to the Board.

viii) Procedure regarding the formulation and sanction of the proposed project:

Government of India has made competitive bidding mandatory for solicitation of proposals for Independent Power Projects (IPPs) and clarified that all future projects should come through the process of competitive bidding.

The government has also emphasized the need to open an alternative route where the industry themselves would be interested to meet their own demand by setting up captive power plants. While this move received a positive response, it was suggested that the possibility of setting up cooperative power plants by an independent entity should be explored. Such plants would not sell any power to the State grid. These generating companies by definition would then be referred to as an IPP, and would require selection through competitive bidding by the State Government or SEB. However, industry revealed a preference to arrive at a negotiated tariff for sale of power from such an IPP to the industry itself.

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[a] On the basis of a detailed exercise done for the State of Gujarat, TERI had made the point that there may not be a need for any surcharge as the threat of losing valued customers, and therefore reduced revenue flows, from the utility was low.

☞ *TERI's views:*

Since the pricing of power sold by the co-generator to the utility is proposed to be done on the basis of the marginal cost of power procurement, the procedure for setting up the cogeneration unit could be left to the industry itself.

ix) If due to breakdown in the Transmission system, the MSEB will not be able to purchase the electricity, developer cannot charge the MSEB for the same.

☞ *TERI's views:*

We propose that the Board should pay deemed generation charges to the cogenerator under the event such as breakdown of its transmission network (other than conditions, which qualify for Force Majeure events,) and also when it does not want to off-take agreed quantum of electricity. If there is a breakdown of line, which connects cogenerator's switchyard to the MSEB's nearest sub-station, the responsibility for restoring it, will be on the utility.

x) MSEB will not provide any facility of Letter of Credit or Escrow for payment of developers

The was no mention of extending the facility of Letter of Credit or Escrow for payment of developers in the GoM policy, however, as per the provisions of MSEB's new policy dated 27/8/2001, it is explicitly disallowed.

The proposed policy under consideration does not support for providing any facility of LoC or Escrow for payment to developers by the MSEB. But the guidelines as issued by the MNES has stated that the board shall also provide facilities of an escrow account or an irrevocable, transferable, divisible and confirmed standard Letter of Credit issued by State Bank of India, or any other nationalized bank, acceptable to the promoter/developer.

☞ *TERI's views:*

In order to provide comfort to the developers of the cogeneration plants and encourage cogeneration, it will be desirable to have such security mechanism (Escrow Facility or extending LoC) for payments as part of EPA. However, presently financial institutions are lending money to developers without mandatory escrow cover. Therefore, policy of providing escrow cover will lead to delays as financial institutions might insist on complying with condition before lending money to the developers. Moreover, given the financial health, it is felt that the government will not be in a position to provide escrow covers to cogenerators.

Therefore, we agree with the proposed policy for not providing any facility of LoC or Escrow for payments to developers. Instead the provisions of interest payable, detailed in sub-section xiii, should suffice.

xi) Some times, if the developer fails to supply the energy as per the PPA, the MSEB should not charge any penalty to the developers.

☞ *TERI's views:*

Board shall be allowed to levy a penalty on the cogenerator in the event if it is not being able to supply energy to the MSEB as agreed. TERI suggests that this penalty be linked to the difference between the marginal procurement cost as defined earlier and the buy-back rate that the utility is offering to the cogenerator. The penalty may be fixed at, say, twice this difference or, in the case where there is no difference, it can be fixed at say 10% of the marginal procurement cost.

xii) Reactive power used by the developer while taking the power from the grid, the MSEB may charge fine @ 0.25 paise per unit.

The MSEB has placed a penalty for shortfall in supply of reactive power by the cogenerator @ 25 Paise per RkVAh as per its Resolution No. 920. In the clause 6.2(b) of the proposed Model PPA, the cogenerator shall supply and deliver and the Board shall be entitled to get reactive power (RKVAH) equal to 40% of the active power.

☞ *TERI's views:*

While it is justified to expect some reactive power contribution from the cogenerator, it is to be noted that the reactive power that can be supplied would also depend on the grid voltage at the MSEB's grid station. Since this grid voltage is not under the control of cogenerator, it may so happen than the voltage (at the grid station) is such that in spite of any voltage control at the cogenerator end the reactive power flow may not exactly conform to a prescribed limit like 40%. It is also seen that there is no credit given to the cogenerator for supply of reactive power close to the load center. Hence, it is suggested that the provision for penalty for RkVAh may be deleted from the policy document.

xiii) The MSEB will honour the bills within 45 days after receipt from the developers of Co-generation, failing which, the interest as per the RBI rate will be payable by MSEB to the developer.

☞ *TERI's views:*

Earlier the board was giving the interest on delayed payments at saving bank rate to the developers. The proposed policy of GoM with the provision to pay interest on late payment at the PLR (Prime Lending Rate) of State Bank of India from due date of payment until the date of payment in full would be welcomed by them.

xiv) Sale to third party by Co-generator will be subject to the following rates as per the Circular No. 640 dated 3.4.2000 by the MSEB regarding Transmission losses and wheeling charges.

Wheeling of energy through the licensee's network should be allowed either in the event of third party sale or licensee buying only part of the electricity generated by the cogenerator. In the existing policy the wheeling charges and transmission losses are determined in terms of distance of transmitted. The wheeling charges and transmission losses are determined as 2% and 5% respectively for a distance of up to 50 km; 4% and 8% respectively for a distance of 50 to 200 km; and 6% and 10% respectively for a distance above 200 km.

☞ *TERI's views:*

Ideally, the transmission losses in the network used for wheeling should be taken for working out the wheeling charges, however, determining the exact path of power flows and thus the losses is difficult. It should be noted that in an interconnected grid energy gets transferred through displacement and the losses may be even less depending upon the relative locations of generators and loads and the electrical characteristics of the interconnecting network.

Indexing the transmission losses with the physical distance of transmission to a load point therefore does not appear to be a rational approach. At the same time considering the quantum of power involved, it is not worthwhile to compute actual incremental losses for different operating conditions. It is therefore proposed that a normative approach based on reasonable average technical losses in HV & EHV system may be adopted. A figure of 5% is proposed for all cases.

Similarly, linking the wheeling charges with the distance over which energy is to be wheeled, is not the right approach. Keeping in view the above we recommend that 2% wheeling charges (as per the GoM's policy for all non-conventional sources and as followed by majority of states in India) should be levied.

xv) Contract Demand

The contract demand will be reduced by the MSEB on request of the developer who used the energy for his own purposes. But if the developer requires energy as stand-by from the MSEB, then the charges of the contract demand will be as per the Captive Generation Policy. When the Co-generation Plant is closed and the developer has not asked for the Stand-by electricity, then MSEB will not charge the Contract demand. When the project is starting up, the board may charge the supply of electricity at the prevailing rates.

☞ *TERI's views:*

We agree with the proposed policy recommendations.

Section II

Policy Framework for Bagasse based Cogeneration

This new policy would be applicable from 01/04/2002. This policy is meant only for bagasse based cogeneration, and shall not be applicable to any other non-conventional sources of energy.

1. Qualification criteria

Since this policy specifically relates to cogeneration it is necessary that the document clearly define the criteria for qualifying a generation facility as cogeneration. [a]The following is proposed in this context which is in line with the MoP resolution of 1996:

1.1 "A cogeneration facility is defined as one, which simultaneously produces two or more forms of useful energy such as electric power and steam, electric power and shaft (mechanical) power etc."

1.2 The cogeneration can be based on (a) topping cycle and (b) bottoming cycle. The qualifying requirements for both these cycles are given below:

Topping cycle: For all cases of cogeneration utilising topping cycle, it is required that at least 20% of the total energy output is in the form of useful thermal energy.

Bottoming cycle: In case of bottoming cycle, the total useful power output in any calendar year must not be less than 50% of the total heat input through supplementary firing.

2. Capacity Limitation:

There shall be no capacity limits for setting up of bagasse based cogeneration plants.

3. Rate of Electricity:

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[a] Ministry of Power: Resolution A-40/95-IPC-I Dt 6th November 1996

3.1 For all existing projects and those, which have signed an Energy Purchase Agreement on or before 01/04/2002, the buy-back price of surplus power would be determined as per the provisions of the existing policy of GoM. Projects, which have not signed an EPA with the MSEB but have made significant progress in getting necessary clearances, a choice be given to the developer for being considered either under old policy or the new policy.

3.2 For new projects and those, which have obtained other necessary clearances but have not signed the Energy Purchase Agreement with the Board, the buy-back price of "Firm"[a] surplus electricity at any given point of time shall be equal to a certain percentage of the "Marginal Cost of Power Purchase" to the MSEB. This percentage could be defined by the ERC (within a given band of say 80-100 %) keeping in view the market conditions. This percentage shall be applicable for the duration of the EPA.

3.3 The "marginal cost of power purchase" here is defined as the total (fixed+variable) cost of power purchase over the year from the plant, which is lowest in the merit order stack.

3.4 "In-firm" [b] power shall be priced at the variable cost of the marginal plant.

4. Protection due to change in Foreign Exchange Rate:

No protection shall be provided to the cogenerators for variations in foreign exchange rate.

5. Evacuation Arrangement

The cost of evacuation facility up to the nearest receiving sub-station of the board shall be borne by the MSEB. All other related expenditure at the cogenerator's switchyard shall be borne by the developer. If augmentation of capacity is required to be done at the sub-station, it shall be done by the MSEB at its own cost.

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[a] Firm Power means the quantum of energy, which a supplier is obliged to deliver as scheduled in the given period.

[b] In-firm Power means the energy supplied over and above the firm power which is interruptible on very short notice.

6. Pass through of Alternate/Conventional Fuel Cost

Alternate/conventional fuels may be used for want of bagasse for generation of electricity in bagasse based cogeneration projects, which may lead to extra cost. The Board shall not allow the pass-through of such additional costs on the tariff due to use of alternate/conventional fuels during the off-season operation.

7. Sale to Third party(s)

7.1 The bagasse based cogenerators will be allowed to sale surplus electricity to the third party(s) from the beginning after paying applicable wheeling charges, transmission losses and additional surcharge. In case, the cogenerators opt for third party(s) sale from the beginning, the Board would be absolved of its responsibility to the co-generator of both assured buy-back and the price linkage. If the co-generator at some time wishes to sell power to the Board, the price for such a transaction would be based on a negotiated settlement.

7.2 However, if the cogenerator wants to sell the power to its own sister concern(s) located away from the plant the same shall also be allowed with a 3 month notice to the utility and subject to the conditions that the cogenerator will pay the wheeling charges and transmission losses to the Board.

8. Procedure regarding the formulation and sanction of the proposed project

Though, the proposed policy of the GoM, for selecting captive projects, makes it mandatory to invite competitive bidding tenders by the industry, given the need for encouraging the use of cogeneration, the selection procedure need not necessarily be on competitive basis.

Since the pricing of power sold by the co-generator to the utility is proposed to be done on the basis of the marginal cost of power procurement, the procedure for setting up the cogeneration unit could be left to the industry itself.

9. In the event MSEB is not being able to purchase the electricity, developer can charge the MSEB for the same

The Board shall pay deemed generation charges at the rate equal to the prevailing buy–back price to the cogenerator under the event such as breakdown of its transmission network and also when it does not want to off-take agreed quantum of electricity.

10. MSEB will not to provide facility of Letter of Credit or Escrow for payment of developers

The Board shall not provide any escrow facility or extend LoC to developers of cogeneration projects.

11. If, the developer fails to supply the energy as per the PPA, the MSEB shall charge "deemed generation charges" from the developers

In the event a cogenerator is not being able to supply energy to the MSEB as agreed in the EPA, the cogenerator shall have to pay "deemed generation charges" linked to the difference between the marginal procurement cost as defined earlier and the buy-back rate that the utility is offering to the cogenerator. The deemed generation charges here in such events may be fixed at, say, twice this difference or, in the case where there is no difference, it can be fixed at say 10% of the marginal procurement cost.

12. No penalty for short-supply of reactive power by the developer

Board shall not levy any penalty for inadequate supply of RkVAh by the cogenerators.

13. The MSEB will honour the bills within 45 days after receipt from the developers of Co-generation, failing which, the interest as per the RBI rate will be payable by MSEB to the developer

The MSEB will honour the bills within 45 days after receipt from the developers of cogeneration, failing which, the interest as per the PLR (Prime Lending Rate) of State Bank of India will be payable by MSEB to the developer until the full payment is made.

14. Transmission losses, wheeling charges and other surcharge

14.1 In the event of third party(s) sale, the Board shall levy a wheeling charge of 2% on the quantity of energy to be wheeled. The Board shall also charge 5% technical losses on the quantum of energy to be wheeled for losses in the HV & EHV system.

14.2 In case, the sale of energy is to a third party(s) other then sister concern(s), the cogenerators will also pay an additional surcharge to be decided by the MERC in addition to above transmission losses and wheeling charges.

15. Contract Demand

15.1 The reduction in the contract demand will be allowed in case power is used for self-consumption. In case standby power from MSEB is required, the contract demand will be charged as per the captive generation policy of MSEB.

15.2 When the Co-generation Plant is closed and the developer has not asked for the Stand-by electricity, then MSEB will not charge the Contract demand. When the project is starting up, the board may charge the supply of electricity at the prevailing rates.

16. Banking of energy

The Board shall allow the banking facility to the cogenerators up to a maximum period of months. However, the banking would not be allowed during certain peak hours to be decided by the Board based on grid characteristics.

17. Taxes

The generator shall pay income taxes as applicable on the profits earned by him from the sale of electricity to the MSEB under this agreement.

18. Duty

The generator shall pay electricity duty on the consumption of electricity either self generated or purchased from the MSEB.

3 Comments on the proposed Draft Model Energy Purchase agreement (EPA)

Our suggestions/modifications on each section and sub-section of the Model Energy Purchase Agreement are detailed below:

Whereas

D. The cost of evacuation facility up to the nearest receiving sub-station of MSEB, and all other related expenditure at the site (i.e. Cogenerator's switchyard) shall be borne by the developer. MSEB shall workout the line charges on a case to case basis. If augmentation of capacity is required to be done at the sub-station, it shall be done by the MSEB at its own cost.

Clause 1. Definitions and Interpretations

1.1Definitions

Commercial operation of the Generation Facility will be deemed to occur on the date the Generator delivers to MSEB a certificate stating that the Generation Facility is operating in accordance with Operating Procedures set forth in Schedule II.

Cogeneration facility is defined as one, which simultaneously produces two or more forms of useful energy such as electric power and steam, electric power and shaft (mechanical) power etc.

Due Date of Payment in relation to any invoice shall mean, the day falling 45 Days after the date upon which such invoice is submitted. If such day is not a business day, the day immediately succeeding will be treated as the Due Date.

RkVAH means Reactive Kilovolt-ampere-hours

Financing Agreement means any of the following:

a) The Generator/ Generators agreements with Lenders for making available to the Generator credit facilities or other funds for the generating facility Project; and
b) The security documents, direct agreements and other ancillary undertakings in favour of lenders required pursuant to the agreements referred to in sub-clauses (a) above.

Equity is the portion of the project cost raised/invested entirely by the generator.

Force Majeure – means any event or circumstance or a combination of events and circumstances which adversely affects the performance by the Party of its obligations under this Agreement; referred to here in, (ii) which are beyond the reasonable control of the party; and (iii) which the party could not have prevented by Prudent Utility Practices.

Firm Power means the quantum of energy, which a supplier is obliged to deliver as scheduled in the given period.

In-firm Power means the energy supplied over and above the firm power which is interruptible on very short notice.

Clause 2. Term

This agreement shall be effective when it has been signed by Parties and shall remain in full force and effect for a period of twenty (20) years determined from the date the Generation Facility begins Commercial Operation, and subject only to termination by other party in terms of this agreement.

(No change in the language of para second and third)

Clause 3. Conditions Precedent

3.1 (g) The project switchyard (.....kV) will be established by the Generator at its own cost under supervision of MSEB for which MSEB will charge supervision charges as applicable in other cases of MSEB works. The procurement and installation work of HT metering including metering CT/PT, isolators will be carried out by MSEB on behalf of Generator.

Clause 4. Power Evacuation Arrangement

MSEB will construct, own, operate and maintain ....kV transmission line from the outgoing gantries of the ....kV switchyard of the Cogenerator. All other related expenditure at the cogenerator's switchyard shall be borne by the developer.

Clause 5. Purchase of Electricity by MSEB

c) Taxes

The generator shall pay income taxes as applicable on the profits earned by him from the sale of electricity to the MSEB under this agreement.

d) Duty

The generator shall pay electricity duty on the consumption of electricity either self generated or purchased from the MSEB.

Clause 7. MSEB Purchase Tariff

7.1 The buyback price of "Firm"[a] surplus electricity at any given point of time shall be equal to a certain percentage of the "marginal cost of power procurement" to the MSEB. This percentage shall be defined by the MERC (within a given band of say 80-100 %) keeping in view the market conditions. This percentage shall be applicable for the duration of the EPA.

7.2 The "marginal cost of power purchase" here is defined as the total (fixed + variable) cost of power purchase over the year from the plant, which is lowest in the merit order stack.

7.3 "In-firm" [b] power shall be priced at the variable cost of the marginal plant.

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[b] In-firm Power means the energy supplied over and above the firm power which is interruptible on very short notice.

7.4 MSEB shall not levy any penalty due to short supply of reactive power on the Generator. MSEB will also not give any credit to the Cogenerator for supply of reactive power close to the load centre.

7.5 All the surplus energy can either be sold to MSEB or to a third party(s) from the beginning after paying applicable transmission losses and wheeling charges and an additional surcharge to be decided by the MERC.

7.6 The Board shall pay deemed generation charges at the buy–back price rate to the Cogenerator under the event such as breakdown of its transmission network and also when it is unable to purchase agreed quantum of electricity.

7.7 The Board shall levy a penalty at the rate linked to the difference between the marginal procurement cost as defined earlier and the buy-back rate that the utility is offering to the Cogenerator. The deemed generation charges here in such events shall be fixed at, twice this difference or, in the case where there is no difference, it shall be fixed at say 10% of the marginal procurement cost.

Clause 8. Invoices and Payment

8.3 Interest on Late Payment

MSEB shall pay the bill within 45 days of submission of the bill. If MSEB fail to make payment required by this Agreement when due, the MSEB shall bear interest as per the PLR (Prime Lending Rate) of State Bank of India for delay beyond Due Date of payment until the date of payment in full.

(rest of the paragraph without any change)

8.4 Payment Mechanism

All payment to be made by MSEB to Generator under this Agreement, shall be made by cheque payable at ....in the account of ....to the account number designated by Generator at an accredited bank in ....Maharashtra, India. Generator will notify MSEB, the account number and other relevant details so that the payment cheques can be properly prepared.

Clause 10. Events of Default and Termination

10.2 Termination

In case MSEB is not purchasing energy in case of Termination of EPA, the generator will be allowed to sell the surplus energy to the Third Party(s). (to be included)

Clause 11. Third Party Sale

11.1 The bagasse based cogenerators shall be allowed to sale surplus electricity to the third party(s) from the beginning after paying applicable wheeling charges, transmission losses and additional surcharge to be decided by MERC.

11.2 In case, the Cogenerators opt for third party(s) sale from the beginning, the Board would be absolved of its responsibility to the co-generator of both assured buy-back and the price linkage.

11.3 If the co-generator at some time wishes to sell power to the Board, the price for such a transaction would be based on a negotiated settlement.

11.4 If the Cogenerator wants to sell the power to its own sister concern(s) located away from the plant the same shall also be allowed with a 3 month notice to the utility and subject to the conditions that the Cogenerator will pay the wheeling charges and transmission losses to the Board.

11.5 If the third party(s) for any reason whatsoever, does not draw fully or partially the energy so generated, it will be the responsibility of the generator to find a suitable third party after taking permission from the Board and Government of Maharashtra.

11.6 In the event of third party(s) sale, the Board shall levy a wheeling charge of 2% on the quantity of energy to be wheeled. The Board shall also charge 5% technical losses on the quantum of energy to be wheeled for losses in the HV & EHV system.

11.7 In case, the sale of energy is to a third party(s) other then sister concern(s), the cogenerators will also have to pay an additional surcharge to be decided by the MERC in addition to above transmission losses and wheeling charges.

4 List of Equipment Manufacturers Designers & Consultants

BOILER MANUFACTURERS

1. Bharat Heavy Electricals Ltd
(BHEL)

Corporate/Registered Office :
BHEL HOUSE, Siri Fort
New Delhi - 110 049

Ph:(011) 6493031
Telex:031-73355/73143
Fax:(011)6493021

Works :
Bharat Heavy Electricals Ltd
High Pressure Boiler Plant,
Tiruchirapalli - 620 014

Dy. General Manager
(Commercial)

Ph: 84311 & 84511
Telex: 0455-211 & 212
Grams: BHARATELEC

Delhi Office :
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Gram:BHELMAN

2 The Indian Sugar &
General Engg. Corpn.
Yamunanagar- 135 001
Harayana)

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Noida - 201 301

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266 59 35
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IJT IN

3. Walchandnagar Industries Ltd
Marketing Division
16, Mahatma Gandhi Road
Pune - 411 001

Mr. S. S. Kulkarni
Asst. General Manager (E & I)
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4. Thermax Babcock &Wilcox Ltd.
Chinchwad
Pune - 411 019

Marketing Deparment
Sugar Complex, Kasarwadi,
Pune - 411 034

Tel. : 0212 771745

Fax : 212 77053

Mr. Ravindra Advani
Divisional Manager

K.P.R. Kamanath
Sr. Manager - Marketing

Registered Office :
Thermax House
4, Bombay-Pune Road
Shivajinagar
Pune - 411 005

5 Cethar Vessels Ltd.
4 Dindigul Road
Tiruchirapalli - 620 001

Ph:0431 - 461 038 / 39 / 40

6 ACC Babcock Ltd.
18th Floor
Express Towers
Nariman Point
Bombay - 400 021

7 IAEC Boilers Ltd.
78, Anna Salai,
Madras - 600 002
Tel : 830465/66

8 Foster Wheeler Engg. Corpn.
Livingston, NJ 07039
USA

9 Texmaco Limited
Works :

Belgharia - Agarpara -
Sodepur & Panihati

Registered Office:
Belgharia
Calcutta - 700 056

10 Krupp Industries India Ltd
Pimpri
Pune - 411 018

Mr. Shekadar, General Manager
(Sugar Projects)

Mr. Chaturvedi, General
Manager Marketing (Sugar
Projects)
Tel : 212 - 775828 / 773964
Fax : 771150

11 The KCP Limited
P. O. Box No. 2278
Tiruvottiur
Madras - 600 019

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Machinery)
Tel : 543301
Fax : 543419

12 National Heavy Engg. Corpn.
Talegaon
Pune
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LIST TURBINE MANUFACTURERS

1. The Triveni Engineering Works
Ltd
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New Delhi - 110 020

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2. DLF Industries Ltd.
Model Town, Sector - 11
Faridabad - 121 006

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Registered/Corporate Office:
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3. APE Belliss India Ltd.
18, Community Centre,
East of Kailash
New Delhi - 110 065

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OR

Mr. Sushil Kumar,Manager (Marketing)

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4. GEC Alsthom Triveni Limited
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5. Asea Brown Boveri Limited
Power Generation Segment
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Mala Anand Mai Ashram Marg
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Apeejay House
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Fort,
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Mr. V. Vishwanathan, Manager (Dresser Rand Divn.)

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7 Bharat Heavy Electricals Ltd (BHEL)

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9. Transelektro Trade Co. Ltd.
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AIFACS Bldg.
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11 Carrier International
385, Madison Avenu
NY, NY 10017, USA

12 Nsho Iwai Corporation
Dalamal towers, 8th Floor,
Bombay - 400 021
Fax : 022-2024138

13 Olga Kova Leva (Russian
Turbinos)
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New Delhi - 110 057

Fax : 011-8676715

14 Forbes Compbell and Co. Ltd.
Warrier Engg. Div.
Forbes Ltd., Charanjit Rai Marg
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Bombay - 400 001

MANUFACTURERS

1. Multi Engineering Services
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Hind NS Road
10-JVPD,
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Tel : 6202232

2. Ratnamani Engineering Ltd.
18, Rajmulat Society
Naranpura
Char Rasta,
Ahmedabad - 380 013
Tel : 478700
Fax : 480999

3. Texfab Engineers
65/66 Adarsh Industrial Estate,
Rakhiel
Ahmedabad - 380 023

4. Gen. Engg. Industries
26/A, Ind. Area
Govindpura
Bhopal - 462 023
Tel : 546692, 546992
Fax : 547678

5. Aarkey Engineers Pvt. Ltd.
4, Vishwas, Azad Road
Vileparle (E),
Bombay - 400 057
Tel : 6148156

6. Monesh Chemo Engg. Pvt. Ltd.
A-51, Queeni Park
Juhu Road, Santacruz (W)
Bombay - 400 049
Tel : 6122205, 6126352

7. Reliance Heat Transfer Pvt. Ltd.
46, Veer Nariman Road,
Fort,
Bombay - 400 001
Tel : 2047004, 2047025
Fax : 2042636

8. Virat Tran. Heat Pvt. Ltd.
201, Sir Vithaldas Chambers,
B. S. Marg,
Bombay - 400 001
Tel : 2048388

9. Life Auto Industries Pvt. Ltd.
Quiet office, 12, Sector 35A,
Chandigarh - 160 036
Tel : 533296
Fax : 530139

10. Flow link Industries Pvt. Ltd.
A-67, Wazirpur Ind. Area
Delhi - 110 052
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11. Mech Engineers
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GIDC,

Gundlav - 396 035

12. Nima Agencies
1-7-1074, Musheerabad,
Hyderabad
Tel : 866005, 867750

13. Bharat Thermal Products
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Madras - 600 085
Tel : 417823

14. DLN industries
38, KC Garden, IInd street
Peravallore,
Madras - 600 082
Tel : 616219, 613349

15. Engineering and Industrial Enterprises
56/1, 3rd Main Road
Gandhi Nagar
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16. Shamraj Engg. Works
Aman B, Dahanukar Colony
Near Gandhi Bhavan
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1. Crompton Greaves Ltd.
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2. Jyoti Ltd.
Post Chemical Industries
Baroda - 390 003

3. Pecon
35, Diamond Harbour Road
Sakher Bzr.
Calcutta - 700 008

4. Kirloskar Electrodyne Ltd.
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MIDC Bhosari
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5. Siemens Limited
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1 John H. Payne Inc
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2. Tata Consultancy Engineers
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3. Humphreys & Glasgow
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4. Tazcogen Development Inc
1001 Country Club Dr. Suite E
Moraga, CA 94556

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5. Vikram Projects Ltd
2C/462, Senapati Bapat Marg
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9. Avant Garde Engineers &
Consultants (P) Ltd
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Porur, Chennai - 600 116

Mr. S. Balasubramanian
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Fax :(044)

10. INTESCO - Bhoruka Limited
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11 Maharashtra Industrial
Technical
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(MITCON) Ltd

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12 SRC International
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13 Financial Energy Mgmt.
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Colorado 80218

14 Lyon Capital Inc.
310, N. San Vincente Blvd.
202, LA, Cal, 90048, USA

15 Bhoruka Power Corporation
Ltd.
48, Levelle Road
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16 Yajna Fuel Services
5, Cr. H., Siddiviayak Ctts.
B Cabin Navpada
Thane - 400 602

17 Resourse Management
Associates
202, State St, Suite 303
Madisan, WI 53703, USA

18 Kiona International Inc.
226, Chatam Lane
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19 R. K. Sirdeshmukh
Malhar, 18-C, Swanand
Soc., Pune - 9

20 BEI Energy Informatics Inc
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21 Winrock International
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Mr. M. V. Dhekne
Director

Annex-A

Power Supply Position in Maharashtra

The installed generation capacity in Maharashtra (including shares from central sector projects) is presently of the order of 14 993 MW comprising 2 847MW hydro, 11 638 MW of thermal, 297 MW of nuclear and 211 MW of wind. Nearly 9 743 MW of this capacity is in state sector, 3 222 MW in private sector and 2 028 MW in central sector. The availability from these power plants is not adequate to meet the power requirements of the state.

An analysis of actual power supply position [a]during April 2001- October 2001 shows that state had a peaking deficit of 14.6% and energy deficit of 7.2%. In fact, the state has been facing continuing power shortages in the past also. As per the [b]Report on the working group on power for 10th Plan, the anticipated power supply position at the end of 10th plan (2006-07) based on 16th Electric Power Survey (EPS) shows that the peaking deficit is likely to increase to 18.8% and energy deficit to 19%.

The above analysis shows that there is a pressing need for evolving a pragmatic strategy for bridging the demand supply gap. The optimal utilization of all available generation, including Bagasse based Cogeneration would, inter-alia merits special consideration in this context.

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[a] CEA: Monthly review of power sector performance

[b] Report on the working group on power for 10th Plan.